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6 April 1966

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To: John Parangosky

Subject: SUIT INLET TEMPERATURES IN DESCENT

We note repeated statements that low remaining fuel at end of cruise would be a flight safety hazard due to causing the pilot to overheat in descent. This theory disregards all Flight Test evidence to the contrary. We believe it is probably based on our own early claims that we would have to descend at full idle power, which as you know is wrong.

If descent actually was made at idle power, the relation to suit inlet temperatures would be as follows:

A. Extremely low bleed pressure at engine idle causes loss in expansion turbine's cooling ability, regardless of heat sink temperature.

B. Engine fuel flow is so small compared to heat sink flow that smart valve would be returning all hot fuel to tank during the descent.

C. This continuous mass return would heat up tank fuel, the rise being more with a low remaining fuel load.

D. Total result of full idle descent would therefore be high cockpit and suit inlet temperatures; probably uncomfortable.

Instead of the above obsolete prediction, we see typically in actual Flight Test data enough engine fuel flow to maintain zero tank return during descent, except during first two to three minutes of deceleration. Even there, only part of the hot fuel returns to tank, with minor affect regardless of tank load. The remainder passes thru smart valve and causes temporary temperature rise, 50°F. typical, at the heat sink loop inlet only. Earlier, with eroded turbines, some of this always appeared as temporary suit inlet rise; with good turbines - zero effect is seen. As for engine bleed pressure to the expansion turbines, the data shows fairly high values during most descents, and never the extreme lows of full idle until seconds before touchdown.

Typical suit inlet temperatures in descent are seen to be on the order of 20° to 30°F., except that below 30,000 feet on the final descent a rise occurs to final 45°F. at touchdown. The latter shift has no relation to heat sink, but is instead the effect of low altitude cockpit pressure on expansion turbine performance. Best cooling can be obtained at any point in descent by maintaining highest possible engine power at all times, regardless of heat sink conditions.

Sensed increase in discomfort during long cruise has also been related by the pilots to decreasing fuel load. This is possibly an offshoot of the early descent theory defined above, which is in no way applicable to cruise. The real reason for discomfort increasing toward the end of a long cruise is the greater heat soak of windows, suit and faceplate with elapsed time. The fact that fuel load happens to be decreasing during the same elapsed time does not make it responsible for cockpit radiation problems.

Witness Silver Javelin Flight 130, S/N 129, where with 6,000 lbs. fuel remaining at end of 1.25 hour high speed cruise the cockpit discharge was still only 50°F., yet pilot comfort level was acceptable only because of special window radiation shields and glove covers.

Best regards,

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